

Title: Abundances of Neutral and Ionized PAH Along The Lines-of-Sight of Diffuse and Translucent Interstellar Clouds

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Abstract: The spectra of neutral and ionized PAHs isolated in the gas phase at low temperature have been measured in the laboratory under conditions that mimic interstellar conditions and are compared with a set of astronomical spectra of reddened, early type stars. The comparisons of astronomical and laboratory data provide upper limits for the abundances of neutral PAH molecules and ions along specific lines-of-sight. Something that is not attainable from infrared observations. We present the characteristics of the laboratory facility (COSMIC) that was developed for this study and discuss the findings resulting from the comparison of the laboratory data with high resolution, high S/N ratio astronomical observations. COSMIC combines a supersonic jet expansion with discharge plasma and cavity ringdown spectroscopy and provides experimental conditions that closely mimic the interstellar conditions. The column densities of the individual PAH molecules and ions probed in these surveys are derived from the comparison of the laboratory data with high resolution, high S/N ratio astronomical observations. The comparisons of astronomical and laboratory data lead to clear conclusions regarding the expected abundances for PAHs in the interstellar environments probed in the surveys. Band profile comparisons between laboratory and astronomical spectra lead to information regarding the molecular structures and characteristics associated with the DIB carriers in the corresponding lines-of-sight. These quantitative surveys of neutral and ionized PAHs in the optical range open the way for quantitative searches of PAHs and complex organics in a variety of interstellar and circumstellar environments.

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